GPS/GLONASS receiver GNS702 Datasheet V1.2

***preliminary** specification*

1 INTRODUCTION

GNS702 is a small autonomous GPS/GLONASS receiver, based upon the MediaTek MT3333 single chip, available with a finely tuned, high-sensitivity ceramic chip antenna. The receiver supports GPS and GLONASS simultaneously.

The navigation performance and accuracy is further improved by using correction data from SBAS (WAAS, EGNOS, GAGAN, MSAS), QZSS.

First Fixes after just a few seconds are achieved with the help of A-GPS using EPO™ (Extended Prediction Orbit) and the EASY™ "self generated orbit prediction" algorithm. EASY™ (Embedded Assist System) does not require any resources or assist data from the host.

The excellent low power design makes it easy to implement this receiver in power sensitive, battery supplied applications. The new AlwaysLocate™ power management feature will improve this behaviour additionally. It adaptively adjusts power consumption depending on the environment and motion conditions, in order to achive a balance between fix rate, power consumption and position accuracy.
Very low power requirements (typ 93mW@ 3.3V, tracking for GPS+GLONASS) and internal voltage regulator makes it easy to run the receiver with various power supplies and allows direct connection to LiIon batteries.

GNS702 offers the industry's highest level of navigation sensitivity up to -165dBm[1]. It has superior dynamic performance at high velocity and provides effective protection against interference signals using MTAIC™ (Multi-tone active interference canceller). Up to 12 independent channel interference continious wave jammers <-80dBm can be eliminated or reduced.

The embedded logger function LOCUS with a 16-hrs on chip memory makes this GPS module a complete track logger for many applications. With AlwaysLocate™ data logging can be achieved up to 32-hrs under standard conditions.

In professional timing applications the outstanding high accuracy PPS (pulse per second) hardware pin is used for synchronization to GPS second. Typical accuracy is 10ns.

[1] Note: Based on chip specifications

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GPS/GLONASS receiver GNS702

Datasheet V1.2

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Features

- GLONASS and GPS simultaneously
- 99 acquisition-/ 33 tracking channels
- Ultra high tracking/navigation sensitivity: -165dBm[1]
- Smart antenna: finely tuned 5.2x3.7x0.7mm ceramic chip antenna
- SBAS (WAAS,EGNOS,MSAS,GAGAN, QZSS) correction support
- A-GPS by EPO "Extended Prediction Orbit" ™ enables 7/14days prediction
- 12 Multitone Active Interference Canceller (MTAIC) for GPS-in-band jammer rejection
- EASY ™ : Self generated orbit prediction support
- AlwaysLocate ™ : Intelligent Algorithm for power saving
- High accuracy 1PPS output
- NMEA-0183 or binary protocol
- High update rate (up to 10/s)
- Embedded logger function with 16hrs internal memory
- GPS current consumption (@3.3V):
  Acquisition: 35mA Typical
  Tracking: 28mA Typical
- Low backup current consumption 7uA, typical
- SMD type with stamp holes
- Small form factor: 16x16x2.1mm
- CE, FCC and RohS certified

[1] Note: Based on chip specifications

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3 FUNCTIONAL DESCRIPTION

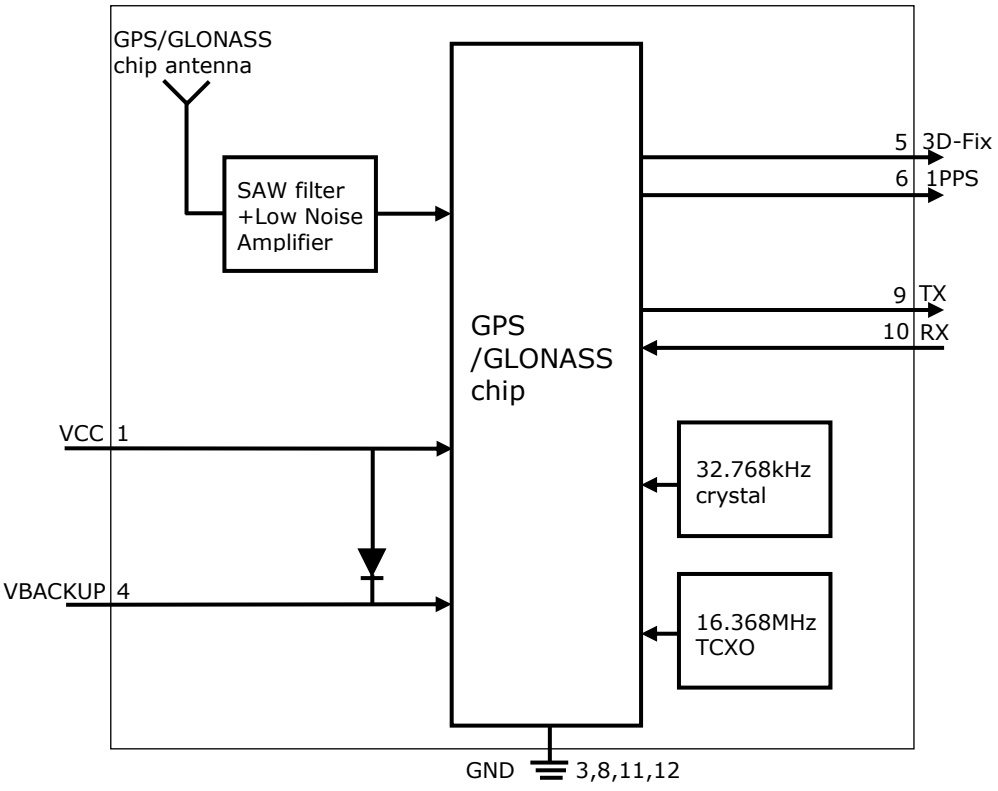
3.1 System description

The GNS702 is a high performance, low power GPS/GLONASS receiver that includes an integrated RF frontend (SAW Filter + LNA) and a finely tuned 5.2x3.7x0.7mm ceramic chip antenna.
Due to high input sensitivity and integrated low noise amplifier (LNA), it can work at weak GPS/GLONASS signals.

GNS702 is a complete autonomous GPS/GLONASS receiver, including:

- Full GPS/GLONASS processing, without any host processing requirements
- Standard NMEA message output
- A powerful NMEA command and control interface
- All clock sources integrated
- RF frontend integrates a low noise amplifier (LNA) and a SAW filter
- Rich additional features like geofencing, single sentence output, last position retention, magnetic variation, distance calculation
- Interface for UART, PPS output pin, Fix Status Indicator pin

3.2 Block diagram



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3.3 GPS and GLONASS simultaneous operation

GNS702 supports tracking of the GPS and the GLONASS satellite system at one time. This feature enhances the overall performance significant.

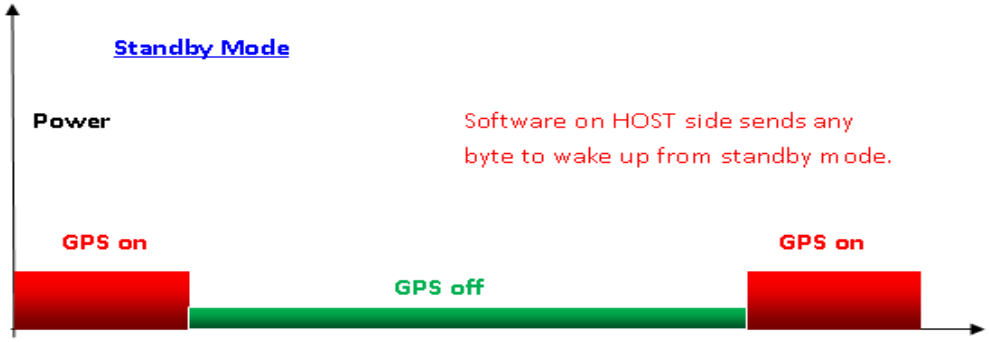
- Increased availability of number of satellites
- Increased spatial distribution allows better geometrical conditions
- Reduced Horizontal (HDOP) and Vertical Dilution of Precision (VDOP) factors

In GPS-only operation, a minimum of 3 SVs is needed to determine a 2D position fix solution. When using both systems, 5 SVs are needed to determine the four unknowns and one more SV to calculate the GPS/GLONASS time offset.
Using a combined receiver, users have an access to potentially 48 or more satellites. This high number of satellites can overcome the typical problems of restricted visibility of the sky, such as in urban canyons or indoor scenarios.

3.4 Power Management Features

Power management schemes implemented for any GPS system requires an optimally tuned performance for both accuracy of the position fixes and the average power consumed for best user experience. GNS702 architecture achieves these both aspects by providing flexibility and design choices for the system integration, based on wide range of use cases and by leveraging on the proven silicon methodologies. Also GNS702 provides position, velocity and time measurements without any host loading. This, coupled with the optional built-in power management options, reduces the overall system power budget.
Selectable Power management features:

- In ***Standby mode*** RF frontend and internal MPU are switched to deep sleep state. Power consumption is reduced.This state can be entered by sending the NMEA command: $PMTK161,0*28<CR><LF>.
  Leaving standby mode and resuming to normal operation will be managed by sending any byte to the module.



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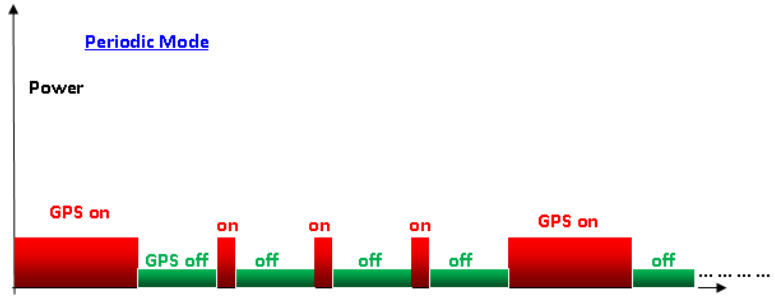
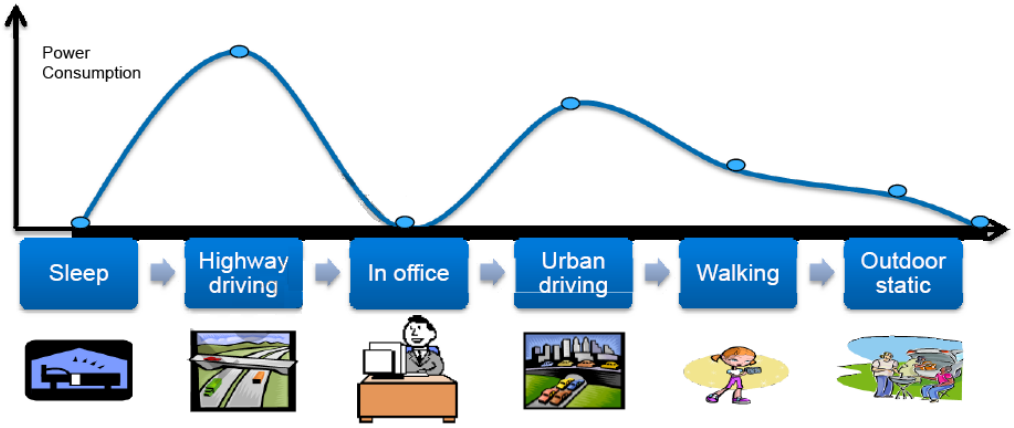
- ***Backup mode*** can be entered by sending NMEA command: $PMTK225,4*2F<CR><LF>. The GPS core will shut down autonomously to backup state, Vcc supply can now be switched off by an external power supply switch.

- ***Periodic mode*** describes a power mode, which will autonomously power on/off the module in programmable time slots with reduced fix rate. Periodic mode is useful during stationary operation or if position fixes are just needed from time to time. Since power consumption in GPS off times is nearly zero, the power consumption in periodic mode can be estimated by $P_{tracking} * (t_{on}/(t_{on}+t_{off}))$.
  Periodic mode is controlled with NMEA command $PTMK225. See document *GPS/GLONASS_NMEAcommandInterface manual* for programming details.



- ***AlwaysLocate***™ feature provides an optimized overall GPS/GLONASS system power consumption in tracking mode under open sky conditions. Always Locate is an intelligent control of periodic mode. Depending on the environment and motion conditions, GNS702 can adjust the on/off time to achieve balance of positioning accuracy and power consumption. The best power saving will be made under good reception in stationary mode. Critical reception conditions and dynamic movements will need full activity of the GNSS engine which causes nominal power requirements (28mA typ in tracking mode).



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3.5 Logger function

GNS702 provides an autonomous logger function that automatically stores position information in an internal 128kB flash memory. A complete tracking unit can be realized without any external CPU or memory.
The parameters for logging are programmable via the NMEA command interface. The following parameter can be set to optimize logging time:

- logger rate

The commands for logger include:

- start logging
- stop logging
- erase memory
- readout memory

please refer to the *GPS/GLONASS_NMEAcommandInterface manual* for details.

Internal Logger Function					
Logger data rate	1/15		1	1/s	
Logger data memory		128		kBytes	Flash memory
Logger trigger		programmable			Logger can be triggered on various events

3.6 Active interference cancellation (MTAIC)

Because different wireless technologies like Wi-Fi, GSM/GPRS, 3G/4G, Bluetooth are integrated into portable systems, the harmonic of RF signals may influence the GPS reception.
The multi-tone active interference canceller can reject external RF interference which come from other active components on the main board, thus improving the performance of GPS reception.
GNS702 can cancel up to 12 independent continuous wave (CW) channels having signal levels of up to -80dBm. The functionality is enabled by default and increases power consumption by about 1mA.

3.7 AGPS with EPO data

AGPS (assisted GPS) allows to shorten TTFF (TimeToFirstFix) by injecting ephemeris data from an external source into the module's memory. With the help of these data, the module does not need to acquire satellite positions by receiving the data from the satellites.
Depending on time and position information, that is still available in the module memory, the TTFF can be reduced to just a few seconds.
The GNS AGPS service is based on a short term predicted data service. The predicted data will be fully processed by the GPS engine. The host must load the data from the web and transfer them over the UART into the module:

1. Check GNS702 module EPO (Extended Prediction Orbit) data for validity by comparing the time.
2. Connect to web server through network connection (GPRS, WLAN, LAN,..).
3. Download file. There are just two files, covering all GPS satellites. The first file (MTK7d.EPO) is for 7 days (53kB), the other is 106Kbytes for 14 days (MTK14d.EPO)

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4. "Parse" file, using software example. This is quite easy, there must be added some header bytes and a checksum and a control counter. GNS offers software support on this.
5. Download to GNS702 receiver. Please refer to the *GPS/GLONASS_NMEAcommandInterface manual* for details.

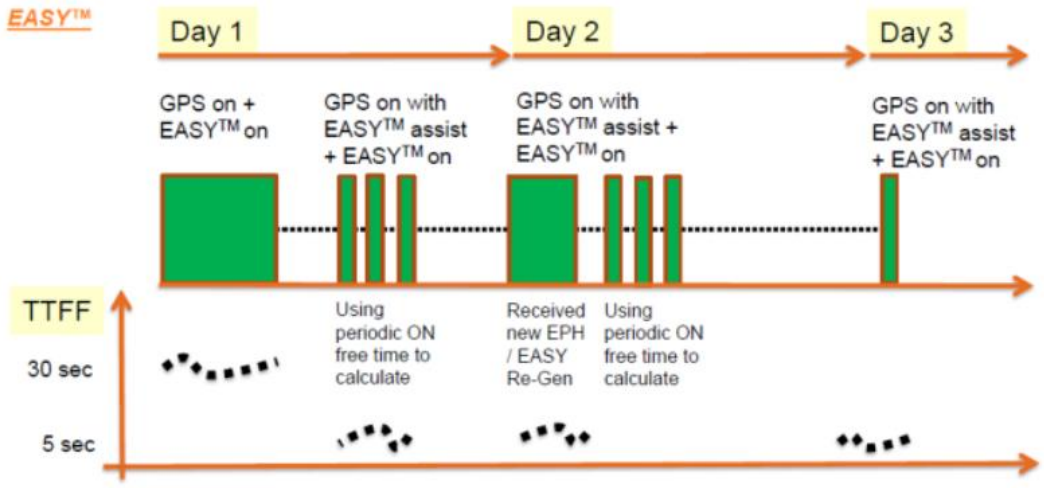
If the host has low memory available, there's no need to save the whole file. The steps 3..5 can be done frame by frame needing less than 2kBytes of buffer memory.

Code samples and support for several platforms are available from GNS (in preparation).
Thanks to the predicted system, download data stay valid for up to 14 days. Therefore, users can initiate the download everytime and benefit from using (W)LAN instead of using expensive GSM.
File size will be ~50kBytes for a one week prediction data set.

AGPS characteristics					
System					6hrs predicted data
File size for data download		53		kB	1 week prediction data
Maximum prediction time	7	14		days	
TTFF		1		sec	Time and last position available
TTFF		15		sec	Last position available

3.8 EASY™ self generated prediction data feature

GNS702 includes an internal prediction system, that allows to sample satellite orbit data during operation and use that data to speed up TTFF on later starts.The prediction time frame is up to three days forward.
Although this prediction feature does not provide the very short TTFF that is achieved using AGPS, it can help to find a fix solution faster and in weak signal condition scenario. Prediction data will be kept in memory as long as VBACKUP is present. This option is activated by default.
Note: The EASY functionality is only supported, if "VBACKUP" pin is conntected and the NMEA update rate is 1Hz.


EASY™
Day 1
Day 2
Day 3
GPS on + EASY™ on
GPS on with EASY™ assist + EASY™ on
GPS on with EASY™ assist + EASY™ on
GPS on with EASY™ assist + EASY™ on
TTFF
30 sec
5 sec
Using periodic ON free time to calculate
Received new EPH / EASY Re-Gen
Using periodic ON free time to calculate

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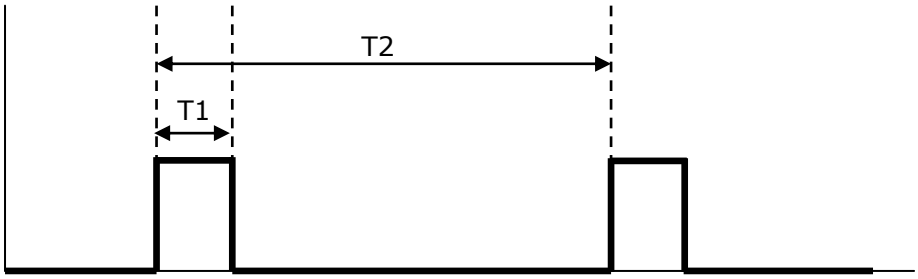
3.9 Pulse Per Second (PPS)

GNS702 provides a Pulse Per Second (PPS) hardware output pin for timing purposes. After calculation of a 3D position fix (default setting), the PPS signal is accurately aligned to the GPS second boundaries. The pulse generated is approximately 100 milliseconds in duration and the repetition rate is 1 second. On request PPS output can activated on a 2D- fix or after power-up of the module, providing a time accuracy decreased PPS signal.



T1 = 100ms T2 = 1sec

GNS702 module provides an exceptionally low RMS jitter of typical 10 nanoseconds.

PPS characteristics based upon a 3D-fix					
1PPS pulse duration	-	100	-	msec	
1PPS time jitter	-	10		nsec RMS	Pulse rising edge deviation from expected pulse time, measured with full 3D fix
1PPS rise and fall time		5		nsec	10%..90%, load is 10k||5pF

3.10 SBAS (Satellite Based Augmentation) support

GNS702 supports Satellite Based Augmentation for improvement of the navigation precision. Correction data is sent from geostationary satellites to the GPS/GLONASS receiver. GNS702 supports European, US, and Asian augmentation systems (EGNOS, WAAS, GAGAN, MSAS, QZSS) to enable precision improvements in nearly every region of the world.
SBAS is active by default and will automatically track the available SBAS satellites. It can be disabled by NMEA command. See document *GPS/GLONASS_NMEAcommandInterface manual* for details
Note : In SBAS mode, the maximum NMEA sentence update rate is limited to 5 per second.

3.11 Single sentence output

GNS702 allows to reduce data transfer to host to a minimum. Reduced data transfer can save host processor activity times and thus reduce system power consumption. All relevant information will be provided in a single sentence output. To save further channel load, the sentence can be formatted as binary. Need of firmware customization.

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3.12 Last position retention

Depending on the application, it might be useful to retain the last position or to clear the position when having no fix solution. Last position retention can be enabled or disabled. When enabled, the last known position is outputted in the NMEA sentences. Need of firmware customization.

3.13 Geofencing function

GNS702 has an internal algorithm to determine whether the actual position is within a circular area around a predefined location point. A proprietary sentence indicates the "inside" or "outside" status. Need of firmware customization.

3.14 Magnetic variation feature

As the magnetic variation feature is enabled, data output provides informations about the degree of magnetic variation and the measured magnetic heading. Need of firmware customization.

3.15 Distance calculation feature

This feature allows to request the real "line of sight" distance in relation to a predefined position. This feature can remove some load from the host processor. Need of firmware customization.

3.16 GPS/GLONASS almanac and ephemeris data

For quick re-acquisition of the GPS/GLONASS receiver after off-times, the GPS/GLONASS engine should have access to almanac and ephemeris data. This data is permanently stored inside GNS702 module, even if all power supplies have been removed. When the receiver is powered-up again, the data will be used to allow a quick re-acquisition, as soon as a coarse time information is available. Time will be available immediately, when RTC is kept running.

3.17 Real time clock (RTC)

GNS702 has a real time clock with 32,768Hz crystal on board. As long as VBACKUP is connected to a power source, the real time clock and the module memory can be kept alive at very low power consumption of just 15uA. The RTC will track the current time and enable the module to start from sleep states with very fast time to first Fix (TTFF).

3.18 UART interface

GNS702 core and I/O sections work at 3.3V nominal. Absolute Maximum Ratings should not be exceeded. Should the GNS702 be interfaced to a host with I/O at higher/lower levels, level shifters should be used. UART baud rate is 9600baud by default. The baud rate can be modified to higher rates by a NMEA software command. See document *GPS/GLONASS_NMEAcommandInterface manual* for details.

UART Default Settings	
Parameter	**Value**
Baud rate	9600
Data length	8 bits
Stop bit	1
Parity	None

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3.19 Module default settings

The GNS702 receiver comes with default settings, which are persistently programmed. Whenever power is removed from the module (both VCC and VBACKUP), the settings will be reset to the values shown in the following table.

Default settings	
Setting	**Default value**
UART setting	9600,8,N,1
Fix frequency (update rate)	1/sec
NMEA sentences	Refer to chapter "NMEA output sentences"
NMEA rate	Once a second: RMC,GSA,VTG,GGA every 5 sec :GSV sentences
DGPS option	SBAS enabled
Datum	WGS 84
MTAIC	enabled
Logging parameters	Full&Stop / Content Basic / Interval 15 sec
Single sentence output	Customized firmware needed
Last position retention	Customized firmware needed
Magnetic variation	Customized firmware needed
Geofencing function	Customized firmware needed
Distance calculation	Customized firmware needed

On request, other options can be selected as preprogrammed (persistent default) options.
Please contact the GNS support for your project requirements.
Note : Customized options are solely available for fixed order lots.

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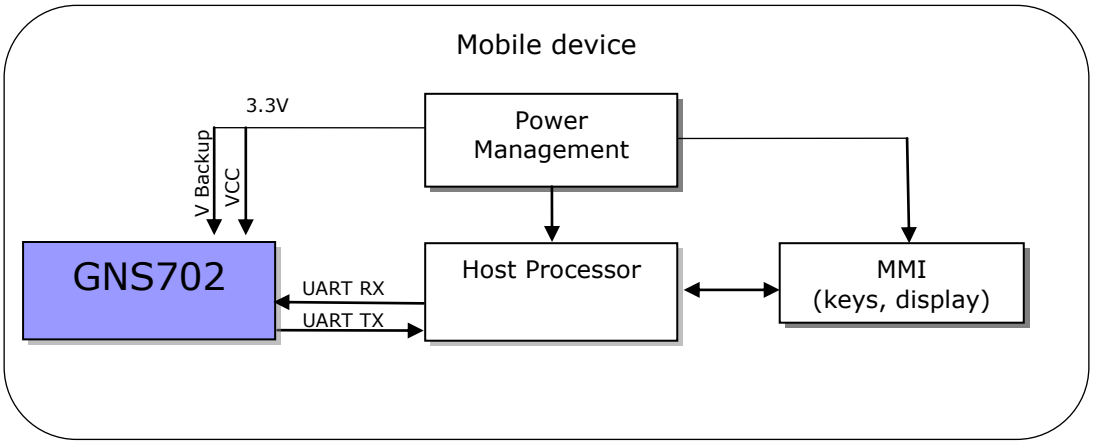
4 TYPICAL APPLICATION BLOCK DIAGRAM

4.1 Typical System Overview



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5 GPS/GLONASS characteristics

5.1 GPS/GLONASS characteristics

Parameter	Min	Typ	Max	Unit	Note
general					
Frequency		1575.42		MHz	GPS L1
		1598.0625~ 1609.3125		MHz	GLONASS L1
Datum					WGS84
AGPS	7		14	days	Configurable
Output data frequency	1/10	1	10	1/sec	
Navigation&tracking sensitivity[1]		-165		dBm	autonomous
Acquisition sensitivity[1]		-148		dBm	Cold start
Reacquisition sensitivity[1]		-163		dBm	Hot start
TTFF hotstart[1]		1		sec	All SVs @-130dBm
TTFF autonomous warm start[1]		33		sec	All SVs @-130dBm
TTFF autonomous cold start[1]		35		sec	All SVs @-130dBm
Reacquisition time[1]		<1		sec	All SVs @-130dBm
Number of channels tracking		33			
Number of acquisition channels		99			
Dimension		16x16x2.1		mm	Tolerance is +/-0.2 mm
Weight		1		g	
Power consumption					
GPS ACTIVE (acquisition)		35		mA	NMEA frequency = 1/sec,SBAS enabled, MTAIC enabled
GPS ACTIVE (tracking)		28		mA	NMEA frequency = 1/sec, SBAS enabled, MTAIC enabled
Backup current @ 3V		15		uA	

Accuracy					
Position error (50%CEP)	-	3	-	m	Without aid 2D-RMS
Position error (50%CEP)	-	2.5	-	m	Using (SBAS) 2D-RMS
Velocity error	-	0.1	-	m/s	Without aid
Velocity error	-	0.05	-	m/s	Using (SBAS)

ITAR limits					
Operation altitude		-	18,000	m	
Operation velocity	-	-	515	m/s	
Operation acceleration	-	-	4	G	

[1] Note: based on chip specifications

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6 DESIGN GUIDELINES

Although GNS702 GPS/GLONASS receiver provides best performance at low power consumption. Special care should be taken to provide clean signal and clean power supplies. Power lines should be blocked near to the receiver with low ESR capacitors.
Radiated noise from neighbour components may also reduce the performance of the receiver. Please refer to "GNS702 Starter Kit User Manual" for more informations, downloadable at the GNS forum: www.forum.gns-gmbh.com .

7 ELECTRICAL SPECIFICATION

7.1 Absolute Maximum Ratings

Parameter	Value	Unit
Supply voltage range: Vcc	3.0 to 4.3	V
Backup voltage: VBACKUP	2 to 4.3	V

7.2 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit	Note
V_{cc}	3.0	3.3	4.3	V	supply voltage
V_{cc} ripple voltage				50	mVpp
VBACKUP	2.0	3.0	4.3	V	Backup voltage for RTC and memory retention, must be available during normal operation
RX0 TTL H Level	2.0		V_{cc}	V	Condition: VCC=3.0V~4.3V
RX0 TTL L Level	0		0.8	V	Condition: VCC=3.0V~4.3V
TX0 TTL H Level	2.4		2.8	V	Condition: VCC=3.0V~4.3V
TX0 TTL L Level	0		0.4	V	Condition: VCC=3.0V~4.3V
Storage temperature	-50		+90	°C	
Operating temperature	-40		+85	°C	

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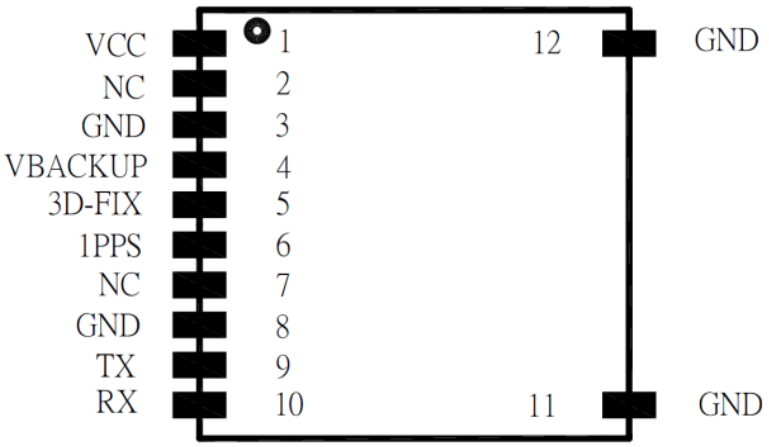
8 PIN CONFIGURATION

Top View



(Top view)

Pin	Name	I/O	Description & Note
1	VCC	P	Main DC power input The main DC power supply for the module. The voltage should be kept between from 3.0V to 4.3V. The ripple must be limited under 50mVpp (Typical: 3.3V).
2	NC		Not connected
3	GND	P	Ground
4	VBACKUP	P	Backup power input for RTC & navigation data keep This connects to the backup power of the GPS module. Power source (such as battery) connected to this pin will help the GPS chipset in keeping its internal RTC running when the main power source is turned off. The voltage should be kept between 2.0V~4.3V, Typical 3.0V. If VBACKUP power was not reserved, the GPS receiver will perform a lengthy cold start every time it is powered-on because previous satellite information is not retained and needs to be re-transmitted. **This pin must be connected for normal operation.**
5	3D_FIX	O	3D-Fix Indicator The 3D_FIX is assigned as a fix flag output. If not used, keep floating. Before 2D Fix The pin will continuously toggle with 1Hz. output one second high-level and one-second low-level signal After 2D or 3D Fix The pin will continuously output low-level signal. **This pin may not connected to high-level at power-on sequence.**
6	1PPS	O	1PPS Time Mark Output 2.8V CMOS Level This pin provides one pulse-per-second output from the module and synchronizes to GPS time. Keep floating if not used.
7	NC		Not connected
8	GND	P	Ground
9	TX	O	Serial Data Output A for NMEA output (TTL) This is the UART-A transmitter of the module. It outputs GPS information for application.
10	RX	I	Serial Data Input A for Firmware update (TTL) This is the UART-A receiver of the module. It is used to receive commands from system
11	GND	P	Ground
12	GND	P	Ground

(1) I = INPUT; O = OUTPUT; I/O = BIDIRECTIONAL; P = POWER PIN; ANA = ANALOG PIN.

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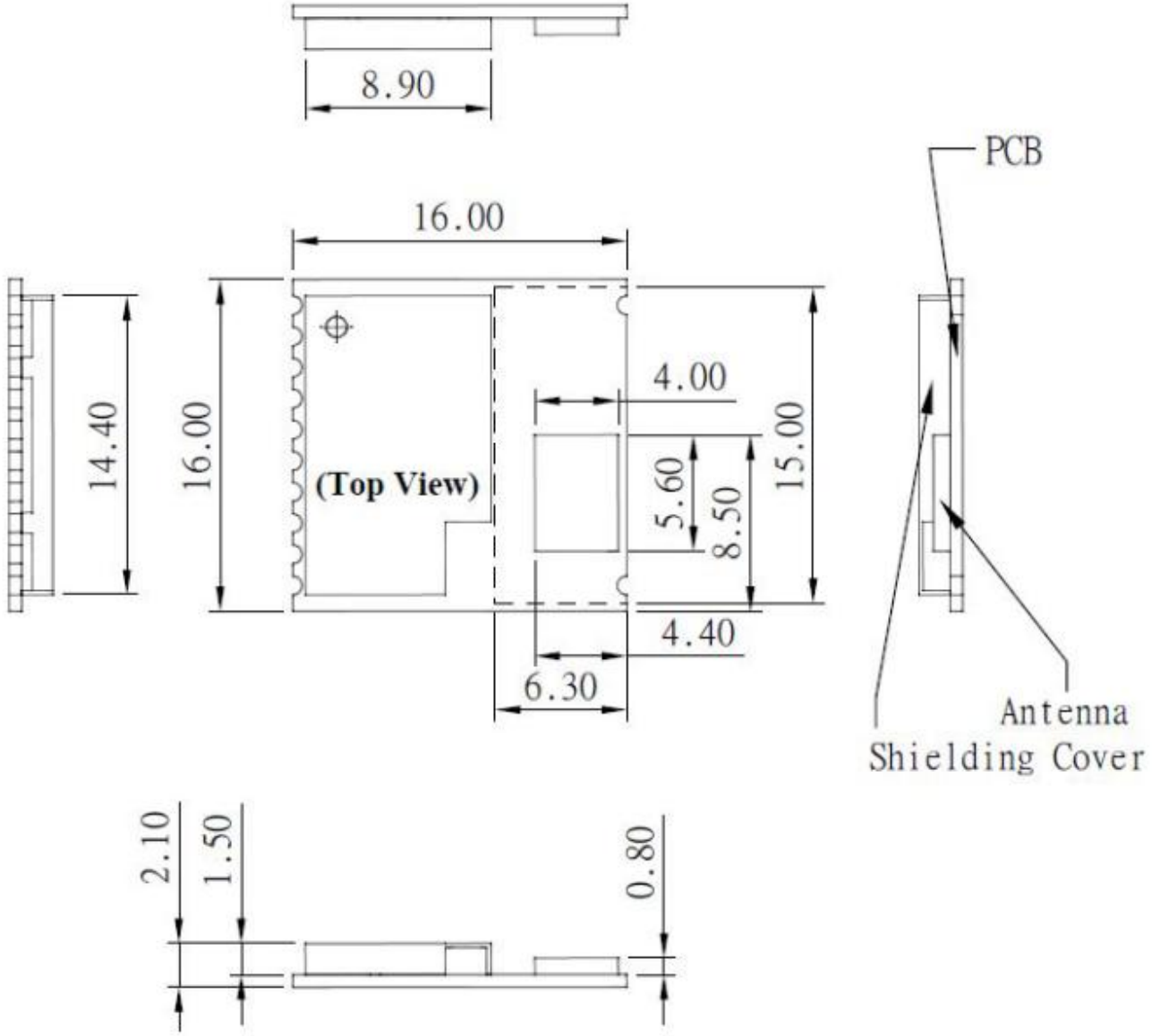
9 PHYSICAL DIMENSIONS

TOP VIEW

all units in mm, tolerance is ±0.2mm



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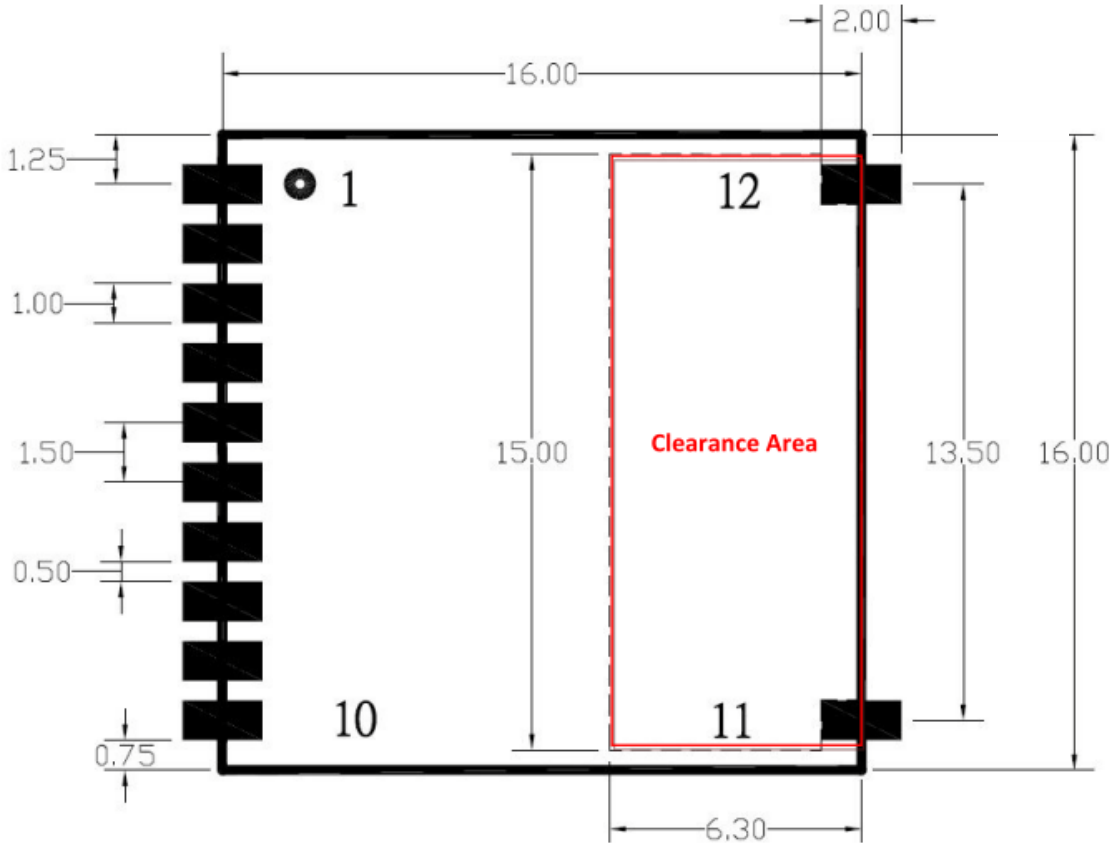
10 RECOMMENDED PAD LAYOUT

all units in mm

Footprint Top View



(Top view)

Note: "Clearance Area": To achieve GPS/GLONASS chip antenna performance it is necessary to remove all metallization from all PCB layers.

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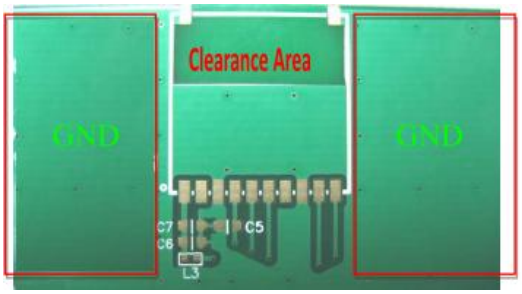
11 RECOMMENDED PCB LAYOUT

To achieve GPS/GLONASS chip antenna performance it is necessary to remove all metallization from all PCB layers. Beside the clearance area it is recommended to place a solid, minimum 20x20mm, ground plane, see picture below. GPS and GLONASS sensitivity will improve if the solid ground plane will extend.



For optimized GPS/GLONASS sensitivity it is adviced to place the GNS702 on the PCB boundary. Do not place the GNS702 near metall components.

12 NMEA DATA interface

GNS702 provides NMEA (National Marine Electronics Association) 0183 compatible data.
A set of proprietary NMEA commands are available to send control messages to the receiver.
These commands are described in a separate document: GPS/GLONASS_*NMEAcommandInterface manual*.
For standard operation, no commands are needed; the module will start outputting NMEA sentences after power supply has been attached. GNS702 will always start communication output with 9600 bit per second.
If non standard options are needed (f.e. other baud rate , other NMEA sequence) they can be programmed from host controller during runtime.
Important note : Options set by using NMEA command interface are not persistent! They will be lost when power is removed. A backup supply at VBACKUP will be sufficient to keep them.

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12.1 NMEA output sentences

NMEA output sentences	
Type	**content**
RMC	Recommended Minimum Navigation Information
GGA	Fix Data, Time, Position and fix related data
GLL	Geographic Position - Latitude/Longitude
GSA	DOP and active satellites
VTG	Course and Speed Information relative to the Ground
GSV	Satellites in view

NMEA output sentences indentifier, retlated to its GNSS system:

NMEA output identifier					
System	**GGA**	**GSA**	**GSV**	**RMC**	**VTG**
GPS	GPGGA	GPGSA	GPGSV	GPRMC	GPVTG
GPS+GLONASS	GPGGA	GNGSA	GPGSV GLGSV	GPRMC[1] or GNRMC	GPVTG

Note1: Before 3D fix RMC output is GPRMC, after 3D fix it changes to GNRMC.

Refer to ***NMEA_protocol*** document available at GNS forum www.forum.gns-gmbh.com for more informations.

12.2 NMEA command interface

GNS702 NMEA command interface allows to control settings and the extended functions. The command interface specification is available in an extra document:
GPS/GLONASS_*NMEAcommandInterface manual.*

Two groups of commands are available:

Setting commands do modify the behavior of the module.
Note : Modified settings will be valid as long as the module is powered through VCC or VBACKUP. (f.e. : setting of a new baud rate). After removing VCC and VBACKUP, all settings are reset to their default values.

Action commands will perform the specified action one time after the command has been received. (f.e. : request for cold start)

Commands are always started with $PTMK, directly followed by the command number 000..999.
Each command must be terminated by *<chksum>and a <CR><LF>.
The checksum calculation is simple, just XOR all the bytes between the $ and the * (not including the delimiters themselves). Then use the hexadecimal ASCII format.

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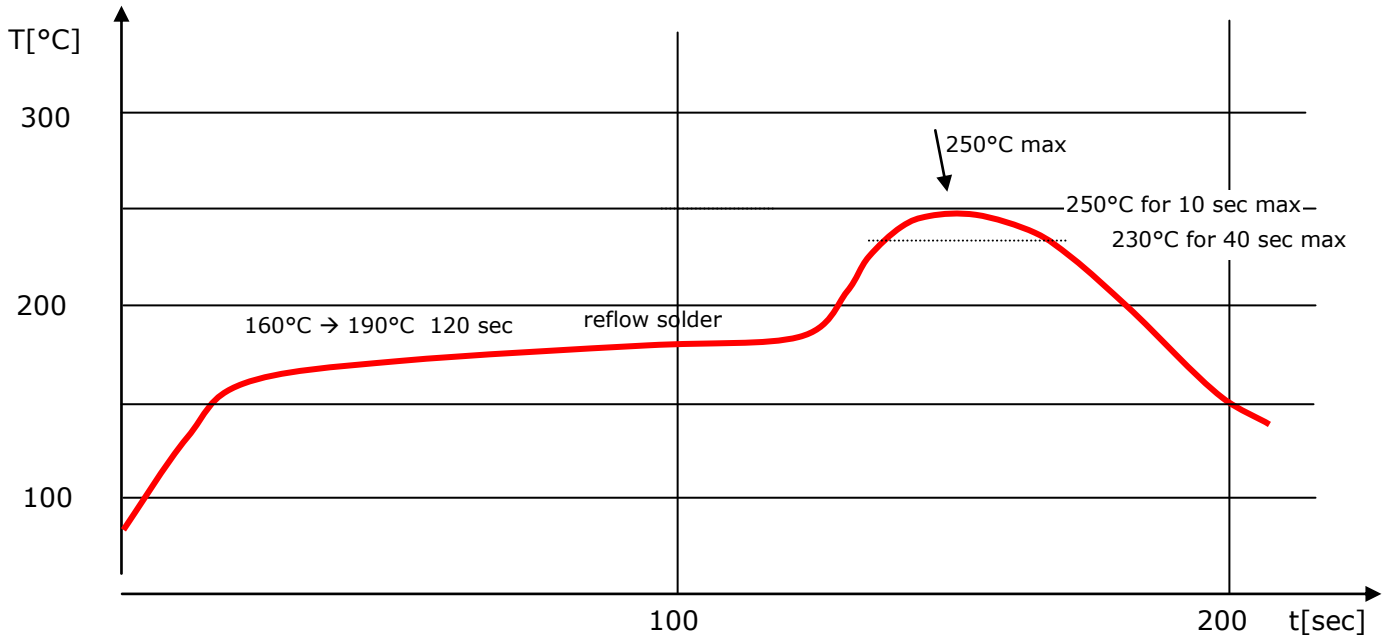
13 MATERIAL INFORMATION

Complies to ROHS standard
ROHS documentations are available on request
Contact surface: gold over nickel

14 RECOMMENDED SOLDERING REFLOW PROFILE



Notes:
1. GNS702 should be soldered in upright soldering position. In case of head-over soldering, please prevent shielding / GNS702 receiver from falling down.
2. Do never exceed maximum peak temperature
3. Reflow cycles allowed : 1 time
4. Do not solder with Pb-Sn or other solder containing lead (Pb)
5. This device is not applicable for flow solder processing
6. This device is not applicable for solder iron process

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15 TRAY PACKAGE INFORMATION

The GPS receivers are placed on a tray. The trays will be stacked and packed together.
The trays are placed inside an antistatic bag.

16 ORDERING INFORMATION

Ordering information			
Type	**Part#**	**label marking**	**Description**
GNS702	**4037735104907**	GNS702 FWV YYWW SN	GNS702receiver FWV => Firmware version YYWW => date code SN => serial number

17 FCC COMPLIANCE

This product has passed FCC 911 compliance successfully. The module emission and immunity has been proven to be compliant.
However, applications using this module as a component must pass CE and/or FCC again in whole.

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18 ENVIRONMENTAL INFORMATION

This product is free of environmental hazardous substances and complies with 2002/95/EC. (RoHS directive).

19 MOISTURE SENSITIVITY

This device must be prebaked before being put to reflow solder process.
Disregarding may cause destructive effects like chip cracking, which leaves the device defective !

Shelf life	6 months , sealed
Possible prebake recommendations	12 hrs @ 60°C
Floor life (time from prebake to solder process)	<72 hrs

20 DOCUMENT REVISION HISTORY

V1.0	Mar 11 2013	M.Reiff	initial document
V1.1	Mar 14 2013	M.Reiff	Backup current value corrected;
V1.2	Apr 5 2013	M.Reiff	PPS direction corrected at block diagram; Label marking changed; Related documents updated;

21 RELATED DOCUMENTS

Title	**Description / file**		**Available from**
GPS/GLONASS NMEAcommandInterface manual	Detailed description of NMEA commands		www.forum.gns-gmbh.com
GNS702 StarterKit user manual	User manual for the GNS702 receiver based evaluation kit		www.forum.gns-gmbh.com
NMEA_protocol	Detailed description of NMEA protocol		www.forum.gns-gmbh.com

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